

Remarks

Claims 1-20 are pending in the application. Claims 1-20 are rejected. All rejections and objections are respectfully traversed. The limitations of claim 2 has been incorporated into claim 1.

Claims 9 and 14 are objected to due to informalities. Claims 9 and 14 have been amended to overcome the objections.

3. Claims 8-14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 8-14 have been amended to overcome the rejection under 35 U.S.C. 112, second paragraph.

Claims 9 and 14 have been corrected to agree with the specification and the figures, see paragraph [035]:

“The first decision in the method 220 is to determine 310 the coding type. If the type is inter-coded, determine 320 the motion type. For inter-coded macroblocks, if the motion type is field-based, then apply field-based filtering 360 to produce the output macroblock 302. However, if the motion-type is frame-based, then determine 330 whether the magnitude of motion vectors (MV) is *greater than* a threshold (T), where the threshold may be set to zero or a non-zero value. For the case when the macroblock is inter-coded and the motion type is frame based, we apply field-based filtering 360 if MV is *less than* or equal to T, and frame-based filtering 370 when MV is greater than T.”

5. Claims 1-8, 12-13, and 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Simsic et al (US 6,269,484 B1, disclosed by Applicants Information Disclosure Statement) in view of Callway et al (US 6,680,752 B1, disclosed by Applicants Information Disclosure Statement).

First, Applicants note that the invention de-interlaces and down-samples compressed video frames. Each frame has an odd field and an even field, which are displayed in an interlaced manner in traditional televisions. Most computer graphics display units operate in a progressive manner, where the pixel lines are displayed sequentially from top to bottom. Therefore, to display the compressed videos on computer graphics displays, the videos need to be de-interlaced.

Basic de-interlacing methods include “**weave**” and “*bob*.” The “**weave**” method interlaces **fields**. The “*bob*” method displays every field as a *frame*. “**Weave**” leads to interlaced **field**-pictures, and “*bob*” leads to *frame*-pictures. Interlaced **field**-pictures are **field** filtered to reduce interlacing artifacts, and *frame* filtering is used otherwise.

There are three types of frames in MPEG-2 video: intra-frames, predicted frames, and bi-directional predicted frames. In the frames, macroblocks can be coded as an intra-macroblock or an inter-macroblock.

The distinction between these terms (“field”/“frame” - “weave”/“bob” - “inter-”/“intra-”) is important to a correct interpretation of the claims.

The Examiner consistently uses the incorrect term “weaver method.”

Applicants assume that the Examiner is referring to the weave method. With all due respect, the Examiner seems to confuse the weave and bob methods.

Simsic further discloses the filtering includes frame-based filtering / “weaver” method and field-based filtering / “bob” method

Simsic further discloses the filtering is field-based / “bob” (motion)

Simsic further discloses the filtering is frame-based / “weave” (no motion)

Applicants also note that motion (or not) can be present or not in both field- and frame-based pictures.

Simsic further discloses the filtering is frame-based / “weave”

Simsic further discloses the filtering is field-based / “bob” method ,
and elsewhere.

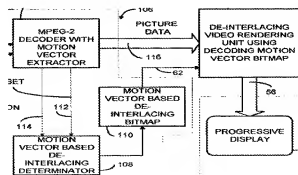
The inconsistent interpretation of the Examiner is difficult to follow and compare with what the prior art actually teaches. In essence, a large part of the Office communication seems to be inconsistent with itself and the prior art. The Examiner has also inverted the meaning of less than and greater than in a number of places, particularly when compared with thresholds, which also makes it difficult to follow the Examiner’s reasoning. The Examiner has also misinterpreted the MPEG term “macroblock transform type.” To the Applicants’ best knowledge, the macroblock transform type has never been used in a joint filter down-sampling method. In the following, the Applicants have attempted to interpret the Examiner’s usage as best as could be understood.

In Simsic, the decoding is entirely based on motion information:

“One embodiment of a de-interlacing device has a decoder that extracts decoding *motion vector* data for use in de-interlacing of decompressed picture data... The decoder has a determinator for determining whether the macroblock of data contains *motion* based on the decoding *motion vector* data. The decoder generates *motion vector* based de-interlacing information containing information indicating whether each macroblock contains *motion* or *no motion* and if desired, a level of confidence that the referenced data is suitable for a particular method of de-interlacing. The video rendering device de-interlaces the interlaced picture data on a macroblock of data basis by applying an adaptive *motion filtering* algorithm to the interlaced picture data for display on the progressive display device.”

Figure 4 shows this process. The decoder 107 extracts picture data 116, which needs to be de-interlaced 118. The only information that is extracted to perform the de-interlacing consists of macroblock mode data 112 and decoding motion vector data 114.

The processing blocks in Simsic are entirely *motion based*. Extracting motion information is complex and takes time and memory:



Simsic does not describe adaptive filtering according to the macroblock coding type and the macroblock transform type, which does not use motion

information. For a macroblock *transform* type, a frame-based transform processes pixels as:

XXXXXXXX
OOOOOOOO
XXXXXXXX
OOOOOOOO

and in a field-based transform the processing order is:

XXXXXXXX
XXXXXXXX
OOOOOOOO
OOOOOOOO

The Examiner states:

Re Claim 2: Simsic further discloses the macroblock coding information includes a macroblock coding type / intracoded [I-frame] and non-intracoded [B-frame, P-frame] and a macroblock transform type / IDCT affected macroblock (see col. 2, lines 23-33, col. 7, lines 53-56, col. 8, lines 61-62, the affect of the IDCT on a macroblock indicates a DCT type transform was used).

With all due respect, the Examiner obviously has confused the IDCT affected macroblock with the DCT macroblock transform type.

Simsic does not describe macroblock transform types. Simsic does not describe filtering based on the macroblock based transform type. Simsic does not describe a filtering and that does not use motion formation. All of Simsic's filtering is motion based.

Obviously, it is extremely advantageous not to use motion information, because extracting motion information takes time and complex computation. This point is made in the present application at paragraph [013]:

“Typically, the interlacing artifacts are detected using *motion information* because only regions with motion need de-interlacing. Although the “adaptive” method can achieve better performance than “weave” or “bob,” the *motion detection is usually computationally expensive and significantly increases the system cost*. Advanced methods such as motion compensated de-interlacing methods can achieve better quality with even greater computational complexity, see U.S. Patent No. 5,784,115, and 6,442,203.”

Callway is nonanalogous art. Callway does not perform macroblock based joint de-interlacing and resolution reduction. Callway de-interlaces on a **line by line** basis, see column 4, and Figure 1:

“In one embodiment, an overlay scaler includes a deinterlacing circuit that provides deinterlaced lines to a vertical scaling circuit that is operatively coupled to receive the deinterlaced data on a **line by line basis**. The vertical scaling circuit provides output to a horizontal scaler to produce horizontally scaled data after deinterlacing has occurred.”

The scalers 114 and 116 operate on a line by line basis. Simsic does not have a line buffer, only macroblocks, therefore Callway cannot be combined with Simsic. Callway cannot be adapted to scale macroblock coded data, and likewise, Simsic cannot be adapted to scale Callway’s lines.

Also, in Callway the de-interlacing and scaling is a *sequential* process. Callway first de-interlaces and then scales vertically and then scales horizontally, see Figure 1.

The claimed filtering and downsampling (scaling) is *joint*, i.e., they are performed at the same time. This is described in the claims as “filtering adaptively *while* downsampling.” This has an advantage in reducing the complexity and time required for the processing, as well as making the filtering and downsampling depend on each other, see paragraph [023]:

“[023] Our invention provides a system and method for jointly de-interlacing and downsampling decompressed video for display, re-encoding or other processing. We perform the de-interlacing and downsampling jointly using an adaptive frame/field filtering process. Our invention is particularly useful when the input compressed video is coded in MPEG-2 frame-pictures, which is currently the dominant video coding method for broadcasting and storage video.”

Neither Simsic nor Callway describe encoding a progressive picture. The Examiner states:

Re Claim 18: Simsic further discloses encoding the progressive picture to an output video (see col. 3, lines 15-25, for the progressive video to be outputted to the display device, some type of encoding occurs for the device to be able to read the output video).

Column 3, lines 19-25, of Simsic states:

comparatively low computation complexity that can cost 25
effectively improve display quality. Also, it would be advantageous to have a de-interlacing system for displaying
interlaced content on a progressive display device wherein
the improved system could be flexibly implemented by
using software, hardware or a combination of software and 25
hardware.

There is nothing in Simsic that would indicate an encoding of the picture data. Figure 1 makes it clear that the output of the decoder is picture data at 30 frames per second. The rendering device outputs the picture data at 60

fps. No encoding is required. The Examiner does not provide any reasoning as to why some type of encoding must occur. The Examiner should provide specific factual findings predicated on sound technical and scientific reasoning to support his conclusion that output of the decoder 60 must be encoded before it can be rendered, or that the output of the rendering device 66 must be encoded before it can be displayed.

In the art of video encoding/decoding, it is well known that decoding is synonymous with decompressing video data, and encoding compresses video data. No compression is required to display decoded video data on a progressive display. It would be wrong to compress decoded data before displaying it. The Examiner is respectfully requested to either provide support and to clearly state his rationale in support of his assertions that decoded video must be encoded to display, or to withdraw his rejections.

With respect to claim 4, claimed is a macroblock transform type that includes a frame-based transform and a field-based transform.

The Examiner states:

Re Claim 4: Simsic further discloses the macroblock transform type includes a frame-based transform and a field-based transform (see col. 6, lines 23-27, col. 5, lines 33-37, col. 2, col. 8, lines 61-67,

There is nothing in the cited sections about frame and field based transforms:

without motion. Generally, intraframe de-interlacing is used in picture areas with motion and field merging (weaving) is used in picture areas without motion. Coefficients in the adaptive filters are based on motion detection functions.
65 However, such systems typically have to determine motion on a pixel by pixel basis from decoded picture information. This can add unnecessary computation time and cost. This is

block of data in a frame (or field). The adaptive motion filtering algorithm for de-interlacing includes the step of de-interlacing by applying a first de-interlacing technique for block of data containing motion and a second de-interlacing technique for block of data determined to contain no motion. 35

of data evaluated. A bit is assigned to each block of data to indicate whether that block of picture data contains motion. In a preferred embodiment a "1" is used to indicate that motion exists for a block of picture data, and a "0" is used to indicate that no motion has been determined for a block of picture data. The bitmap data 64 containing motion 35

The confidence level determination may be done by calculating an average absolute value of difference data for each pixel. Other methods may also be used. If the macroblock data would be significantly altered by the IDCT data, a 1 is set in the bitmap indicating that there is not motion for the macroblock as shown in block 157. If the confidence level data indicates that the referenced data would not materially alter the picture, a 0 is set in the bit map as shown in block 156. It will be recognized that other

With all due respect, the Examiner's assertion that the affect of IDCT on a macroblock is related to the claimed macroblock transform type is incorrect.

The Examiner asserts:

Re Claim 7: Simsic further discloses the filtering includes frame-based filtering / "weaver" method and field-based filtering / "bob" method (see col. 2, col. 5, lines 33-37).

With respect to claims 5-8, Simsic discloses a "weave" method that is field based and a "bob" method that is frame based. The rejection of claims 5-7 is improper. Recall, the weave method leads to interlacing artifacts that need to be field filtered.

With respect to claim 12, Applicants note that the Examiner has incorrectly interpreted the DCT transform type as an affected ICDT macroblock.

With respect to claims 13-17, see above.

With respect to claim 18, as stated above, Simsic does not describe encoding (compressing) the output of his decoder.

With respect to claim 20, see above.

6. Claims 9-11 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Simsic as modified by Callway, and further in view of Yeh et al (US 2004/0233329

The Examiner states:

Re Claim 9 [as best understood by the Examiner]: Simsic further discloses the filtering is field-based / "bob" method (motion) when the macroblock coding type is inter-coding / non-intracoded, the macroblock motion type is frame-based / motion type frame, and the motion vectors corresponding to the macroblock are greater than a threshold (see

With all due respect, this is not what Simsic teaches, see:

"With the "weave", or merge method, successive even and odd fields are merged. Each frame to be displayed is constructed by interleaving the scan lines of a pair of fields." and "In contrast to the "weave" method, the "bob" method displays single fields as frames."

The Examiner states:

166 checks if the frame based inter-coded motion vectors are greater than a threshold and if they are "1" makes the filtering field based or "bob").

This is not what is claimed. Applicants claim a method in which the filtering is field-based when the macroblock coding type is inter-coding, the macroblock motion type is frame-based, and an absolute value of motion vectors corresponding to the macroblock are less than a threshold.

With respect to claims 9-17, the Examiner states:

Yeh discloses filtering is field-based / "bob" when the absolute value of motion vectors corresponding to the macroblock are greater than a threshold (see Fig. 1, paragraph [0017], lines 13-21, apply the "bob" filter if the absolute value of the motion vectors is larger than the threshold).

Bob should use frame-based, filtering not field based.

With respect claim 10, claimed is a threshold is greater than zero. At paragraph [0020], Yeh states :

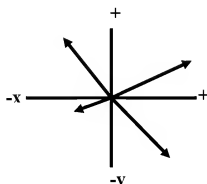
motion vectors ~~16~~ and the result shows the calculation value of motion vectors is essentially greater than signal of the threshold (for example, signal of "1"), then delivering the

Yeh says the signal is greater than the threshold, claimed is a threshold greater than zero. These are not equivalent.

With respect to claim 14, weave is field based, not frame based.

Also, the Examiner repeatedly, uses the term “weaver” there is no such thing as weaver in any of the references.

With respect to claims 9 and 14, the Examiner states: “although motion vectors are always positive (therefore there really isn’t a need for the absolute value of them...)” With all due respect this is completely wrong. Motion vectors are always signed to indicate the magnitude and direction, see below.



Therefore, there is a need for the absolute value to determine just the magnitude.

Also, note claim 14 claims “less than.” The Examiner states that Yeh discloses “greater than.”

It is believed that this application is now in condition for allowance. A notice to this effect is respectfully requested. Should further questions arise

concerning this application, the Examiner is invited to call Applicants' attorney at the number listed below. Please charge any shortage in fees due in connection with the filing of this paper to Deposit Account 50-0749.

Respectfully submitted,
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